EAST WATERWAY OPERABLE UNIT
QUALITY ASSURANCE PROJECT PLAN
JUVENILE CHINOOK SALMON TISSUE COLLECTION AND CHEMICAL ANALYSIS

For submittal to:

The US Environmental Protection Agency
Region 10
Seattle, WA

May, 2009

Prepared by:

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Approvals

Windward Project Manager	Susan McGroddy Name	2.8.10 Date
Windward QA/QC Manager	Ted Dahl Name	2.8.10 Date
EPA Project Manager	Name	2/9/10 Date
EPA QA Officer	Name	2/9/10 Date

Distribution List

This list identifies all individuals who will receive a copy of the approved quality assurance project plan, either in hard copy or electronic format, as well as any subsequent revisions.

- Ravi Sanga, EPA Project Manager
- Susan McGroddy, Windward Project Manager
- Matt Luxon, Windward Task Manager
- Thai Do, Windward Field Coordinator
- Ginna Grepo-Grove, EPA QA/QC Manager
- Marina Mitchell, Windward QA/QC Manager

Chemistry Project Managers:

- Sue Dunnihoo (Analytical Resources, Inc.)

East Waterway Group:

- Doug Hotchkiss, Port of Seattle
- Debra Williston, King County
- Jeff Stern, King County
- Peter Rude, City of Seattle

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Figures and Maps

Acronyms

%RSD	percent relative standard deviation
ASTM	American Society for Testing and Materials
COC	chain of custody
DMM	Data Management Manual a
DQO	data quality objective
DQI	data quality indicator
EPA	US Environmental Protection Agency
ERA	Ecological risk assessment
FC	field coordinator
GPS	global positioning system
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
MDL	Method detection limit
NMFS	National Marine Fisheries Service
NRC	Natural Resource Consultants
PCB	polychlorinated biphenyl
PM	Project manager
PSEP	Puget Sound Estuary Program
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RI	Remedial Investigation
RM	river mile
RPD	relative percent difference
SDG	sample delivery group

1 Introduction

This quality assurance project plan (QAPP) addendum describes the sampling design and quality assurance (QA) for collecting and analyzing juvenile Chinook salmon (*Oncorhynchus tshawytscha)* and juvenile chum salmon (*Oncorhynchus keta*) tissue at two nearshore locations in the East Waterway (EW) in two separate sampling events. Details about project organization and management, field data collection methods, sample handling, laboratory analytical protocol, and data management and documentation are provided. Additional details are provided in the Fish and Shellfish Tissue Collection QAPP (Windward 2008), of which this addendum relates to. This QAPP addendum was prepared in accordance with guidance for preparing QAPPs from the US Environmental Protection Agency (EPA 2002).

Data from this study will be used to support the ecological risk assessment (ERA) for the Supplemental Remedial Investigation (SRI) and Feasibility Study (FS) for the EW. This document is organized as follows:

- Section 2 – Project management
- Section 3 – Data generation and acquisition
- Section 4 – Assessment and oversight
- Section 5 – Data validation and usability
- Section 6 – References

Field collection forms are included as Appendix A. The health and safety plan (HSP), data management procedures, and risk based analytical concentration goals are attached to the Fish and Shellfish Tissue Collection QAPP (Windward 2008).

2 Project Management

This section describes the overall management structure of the project, identifies key personnel, and describes their responsibilities, including field coordination, quality assurance and quality control (QA/QC), laboratory management, and data management. The East Waterway Group (EWG) and the US Environmental Protection Agency (EPA) will be involved in all aspects of this project, including discussion, review, and approval of the QAPP, and interpretation of the results of the investigation.

2.1 PROJECT ORGANIZATION

This sampling effort will be performed by Windward with Taylor Associates performing the fishing. The overall project organization and the individuals responsible for the various tasks required for tissue sample collection and analysis are presented in

Figure 2-1. Responsibilities of project team members, as well as the laboratory project manager (PMs), are described in the following subsections.

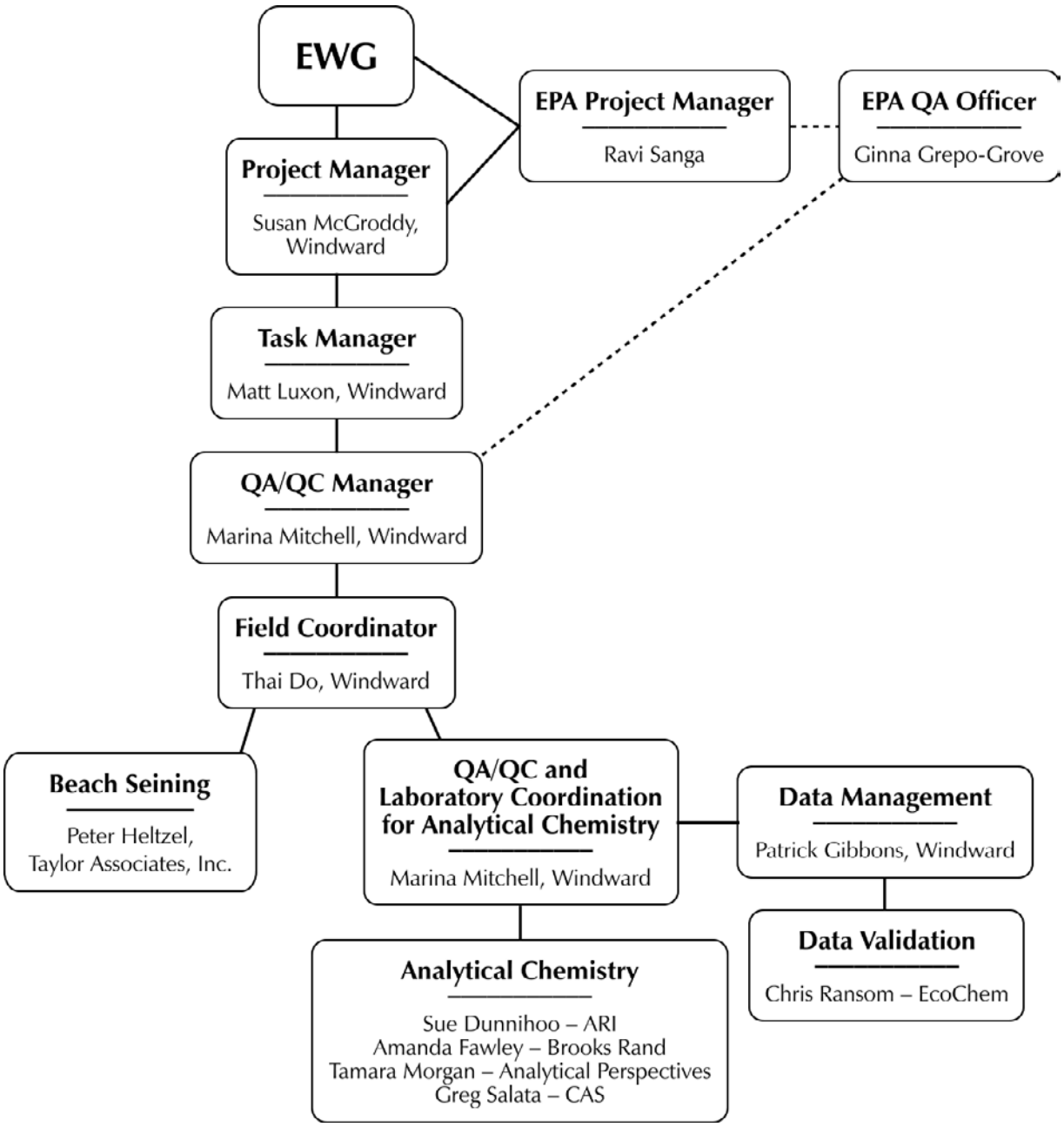

Figure 2-1. Project organization and team responsibilities

2.1.1 Project management

EPA will be represented by its PM, Ravi Sanga. Mr. Sanga can be reached as follows:

Mr. Ravi Sanga
US Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900
ECL-111
Seattle, WA 98101-3140
Telephone: 206.553.4092
Facsimile: 206.553.0124
E-mail: Sanga.Ravi@epamail.epa.gov

Susan McGroddy will serve as the Windward PM and will be responsible for overall project coordination and providing oversight on planning and coordination, work plans, all project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. She will also be responsible for coordinating with EWG and EPA on schedule, deliverables, and other administrative details. Dr. McGroddy can be reached as follows:

Dr. Susan McGroddy
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.577.1292
Facsimile: 206.217.0089
E-mail: susanm@windwardenv.com

Matt Luxon will serve as the Windward task manager (TM). The TM is responsible for project planning and coordination, production of work plans, production of project deliverables, and performance of the administrative tasks needed to ensure timely and successful completion of the project. The TM is responsible for communicating with the Windward PM on progress of project tasks and any deviations from the QAPP. Significant deviations from the QAPP will be further reported to EWG and EPA. Mr. Luxon can be reached as follows:

Mr. Matt Luxon
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.577.1293
Facsimile: 206.217.0089
Email: mattl@windwardenv.com

2.1.2 Field coordination

Thai Do will serve as the Windward field coordinator (FC). The FC is responsible for managing the field sampling activities and general field and QA/QC oversight. He will

ensure that appropriate protocols for sample collection, preservation, and holding times are observed and will oversee delivery of environmental samples to the designated laboratories for chemical analysis. Deviations from this QAPP will be reported to the TM and PM for consultation. Significant deviations from the QAPP will be further reported to representatives of EWG and EPA.

Peter Heltzel will be the Taylor Associates Field Coordinator and will be responsible for conducting beach seining activities following the protocol described in this QAPP addendum. Thai Do and Peter Heltzel can be reached as follows:

Mr. Thai Do
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.812.5407
Facsimile: 206.217.0089
Email: thaid@windwardenv.com

Mr. Peter Heltzel
Senior Fisheries Biologist
Taylor Associates, Inc.
7104 Greenwood Ave. N.
Seattle, WA 98103
Telephone: 206-267-1402
Facsimile: 206-267-1401
Email: peter@taylorassoc.net

2.1.3 Quality assurance/quality control

Marina Mitchell of Windward will oversee QA/QC for the project. As the QA/QC manager, she will oversee coordination of the field sampling and laboratory programs and supervise data validation and project QA coordination, including coordination with the EPA QA officer, Ginna Grepo-Grove.

Ms. Mitchell can be reached as follows:

Ms. Marina Mitchell
Windward Environmental LLC
200 W Mercer Street, Suite 401
Seattle, WA 98119
Telephone: 206.812.5424
Facsimile: 206.217.0089
Email: marinam@windwardenv.com

Ms. Grepo-Grove can be reached as follows:

Ms. Ginna Grepo-Grove
US Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 900 (OEA-095)
Seattle, WA 98101
Telephone: 206.553.1632
Email: grepo-grove.gina@epa.gov

EcoChem Inc., will provide independent third-party review and validation of analytical chemistry data. Chris Ransom will act as the data validation PM and can be reached as follows:

Ms. Chris Ransom
EcoChem Inc.
Dexter Horton Building
710 Second Avenue, Suite 600
Seattle WA 98104
Telephone: 206.233.9332
Email: cransom@ecochem.net

2.1.4 Laboratory project management

Marina Mitchell of Windward will serve as the laboratory coordinator for the analytical chemistry laboratory (see contact information in Section 2.1.4). Analytical Resources, Inc. (ARI), Analytical Perspectives, and Columbia Analytical Services, Inc. (CAS) will perform chemical analyses. Sue Dunnihoo will serve as the laboratory PM for ARI, Tamara Morgan will serve as the laboratory manager for Analytical Perspectives, and Greg Salata (or other qualified personnel) will serve as the laboratory PM for CAS. The laboratory PMs can be reached as follows:

Ms. Susan Dunnihoo
Analytical Resources, Inc.
4611 S 134th Place, Suite 100
Tukwila, WA 98168
Telephone: 206.695.6207
Email: sue@arilabs.com

Ms. Tamara Morgan
Analytical Perspectives
2714 Exchange Drive
Wilmington, NC 28405
Telephone: 910.794.1613
Facsimile: 910.794.3919
Email: tmorgan@ultratrace.com

Mr. Greg Salata
Columbia Analytical Services, Inc.
1317 S 13th Avenue
Kelso, WA 98626
Telephone: 360.577.7222
Facsimile: 360. 636.1068
Email: gsalata@kelso.caslab.com

The laboratories will do the following:

- Adhere to the methods outlined in this QAPP, including those methods referenced for each procedure
- Adhere to documentation, custody, and sample logbook procedures
- Implement QA/QC procedures defined in this QAPP
- Meet all reporting requirements
- Deliver electronic data files as specified in this QAPP
- Meet turnaround times for deliverables as described in this QAPP
- Allow EPA and the QA/QC manager, or a representative, to perform laboratory and data audits

2.1.5 Data management

Ms. Kim Goffman will oversee data management to ensure that analytical data are incorporated into the EW database with appropriate qualifiers following acceptance of the data validation. QA/QC of the database entries will ensure accuracy for use in the ERA and HHRA.

2.2 PROBLEM DEFINITION/BACKGROUND

Windward Environmental LLC (Windward) is conducting an ERA of the EW. The objective of the ERA is to estimate risks to ecological receptors in support of the SRI/FS for EW. The ERA along with a human health risk assessment and consideration of background levels of chemical concentrations will be the basis of any sediment cleanup efforts in the EW.

The primary objectives for the tissue data to be collected under the juvenile Chinook salmon QAPP addendum are to:

- Characterize chemical exposure for the juvenile Chinook salmon, an ecological receptor of concern (ROC) in the ERA, through all exposure routes via a tissue residue exposure analysis.[1]
- Characterize chemical exposure to juvenile Chinook salmon[2], and wildlife ROCs (birds and mammals) through the food chain via dietary exposure analyses.

WDFW describes the status of the federally threatened species Green River (Duwamish) Chinook salmon as "healthy" (http://wdfw.wa.gov/fish/sasi/). In previous EW sampling events, juvenile Chinook salmon were caught in seine nets from April through September, with peak numbers found in April through July (Shannon 2006). During this time, juvenile Chinook salmon have completed their physiological adaptation to higher salinity, and they would be expected to use EW to feed on epibenthic and neritic[3] food sources (Healy 1991).Juvenile Chinook are generally regarded as the most estuarine dependant salmonid. Residence time of juvenile Chinook salmon in the 1 ½ mile long East Waterway is unknown. In the 5 mile long Lower Duwamish Waterway immediately upstream of the East Waterway, wild juvenile Chinook salmon average residence time has been estimated to be from about 2 weeks to two months (Ruggerone and Volk 2004). Ruggerone and Volk report that average residence time of wild juvenile Chinook salmon in the LDW decreased from approximately 20 days for fish captured in early June to about 15 days for late June and July then increased again to about 20 days for August and 58 days for fish captured in September (Ruggerone and Volk 2004). Average residence time of hatchery juvenile Chinook salmon was somewhat shorter than that of wild fish in early June and thereafter somewhat longer than wild fish.

Since the numbers of both wild and hatchery juvenile Chinook in EW can be limited (Table 2-1), juvenile chum salmon will also be collected as a potential surrogate for juvenile Chinook salmon. Juvenile coho salmon are another potential surrogate, however, historical data from the EW suggest that too few juvenile coho are available to target them (Table 2-1). Additionally, juvenile coho are generally considered less estuarine dependant than are juvenile Chinook or chum salmon (Sandercock 1991), thus, their residence in the EW is likely to be less than that of chum, making them a poorer surrogate. Juvenile chum salmon are by far the most abundant juvenile salmon

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[1] A tissue-residue approach is not appropriate for estimating risk to juvenile Chinook salmon from PAHs or metals (other than TBT, mercury, and selenium) because fish actively regulate these COIs.

[2] For metals (other than TBT, mercury, and selenium) an exposure media (i.e., diet or water) approach is preferred. Stomach contents chemistry data will be used to assess dietary risk to juvenile Chinook salmon. Thus, stomach contents will only be analyzed for PAHs and metals (other than TBT, mercury, and selenium).

[3] Nertic refers to the part of the ocean extending from the low tide mark to the edge of the continental shelf, with a relatively shallow depth extending to about 200 meters (100 fathoms). This area contains organisms such as zooplankton, phytoplankton, floating sargassum, small fish and shrimp.

in the EW (Table 2-1). Chum salmon in the EW are not listed under the endangered species act. Juvenile chum salmon are also highly dependent on estuaries, feed on similar organisms, and have similar habitat use as juvenile Chinook salmon. Juvenile Chum salmon residence time in the EW is also unknown. Mark-recapture data reported in Weitkamp and Schadt (1982) indicate that chum residence time in the LDW is about 1 week. Whereas, in this same study, the longest Chinook residence reported was 24 days. Weitkamp and Schadt (1982) also report diets of juvenile Chinook and juvenile chum salmon collected in purse nets and beach seines from the LDW and nearby in Elliott Bay. Both species were more frequently caught in beach seines than purse nets indicating use of near-shore rather than deepwater habitats. LDW chum diets consisted of 53% benthic dipteran midge larvae and pupae and 41% pelagic calanoid copepods. Similarly diets of juvenile Chinook salmon from Elliott Bay were primarily calanoid copepods and epibenthic harpacticoid copepods. Although there is a large degree of overlap in Chinook and chum diets, where they co-occur, juvenile Chinook salmon tend to be slightly larger and eat larger, slightly higher trophic level organisms (Healy 1991). Weitkamp and Schadt (1982) reported that Chinook were on average larger than chum (~70 vs. 50 mm) and that this appeared to influence their prey preference. Because they have similar habitat use and prey preferences, juvenile chum salmon are a reasonable surrogate species for juvenile Chinook salmon, if an insufficient number of juvenile Chinook salmon are collected but a sufficient number of juvenile chum salmon are collected to meet the sampling objectives.

Table 2-1. Total numbers of juvenile Chinook salmon, juvenile chum salmon, and juvenile coho salmon captured by beach seine in the East Waterway during monthly sampling between 1998 and 2003

Year	Site	Month	Hatchery Chinook[A]	Wild Chinook	Chum	Coho	No. Sets[B]
1998	Slip 27	Apr	0		375	0	9
		May	113		23	0	6
		Jun	51		46	2	6
		Aug	11		2	0	3
2000	Pier 36	May	23	11	1013	0	4
		Jun	53	37	584	0	6
		Jul	39	32	10	0	4
		Aug	7	5	2	0	4
		Sep	0	0	0	0	4
		Oct	0	0	0	0	4
	Slip 27	Apr	0	0	1489	0	3
		May	51	21	410	0	6
		Jun	123	43	245	4	9
		Jul	6	15	0	0	6
		Aug	1	2	0	0	6

Year	Site	Month	Hatchery Chinook[A]	Wild Chinook	Chum	Coho	No. Sets[B]
		Sep	0	1	0	0	6
		Oct	0	0	0	0	6
2002	Slip 27	Apr	0	0	100	0	3
		May	20	14	84	18	9
		Jun	184	18	449	4	6
		Jul	18	13	64	1	6
		Aug	6	7	7	8	3
		Sep	0	0	0	2	3
		Oct	0	0	0	0	3
2003	Slip 27	Febr	0	17	0	0	9
		Mar	0	18	204	0	9
		Apr	0	4	2897	0	6
		May	18	7	281	1	6
		Jun	29	13	1006	4	6
		Jul	4	2	1	1	6
		Aug	0	0	0	0	3
		Sep	1	0	0	1	3

[a] Sum of hatchery fish, and fish of unknown origin

[b] No. sets is the number of times a beach seine was successfully deployed

Juvenile Chinook salmon total PCB tissue concentration data from the Lower Duwamish Waterway, immediately upstream of the EW (RM 0.3 to 0.9) indicate that contaminant concentrations in wild and hatchery salmon are similar, whereas those hatchery fish collected further upstream in the LDW (RM 2.7 to 2.9) had higher PCB concentrations (Windward 2004) (Table 2-2).[4] Because there are possible differences in chemical body burdens, hatchery and wild fish whole body samples should not be composited together if it is possible to meet the sampling objectives by analyzing them separately.

[4] Note that PCB concentrations in hatchery fish may have been elevated due to contaminated hatchery food, which is believe to have been subsequently replaced with a cleaner food source.

Table 2-2. Total PCB concentrations (sum of Aroclors) in hatchery and wild juvenile Chinook salmon whole-body composite samples collected from the LDW June 23 to 26, 2003

Location	Composite	Total PCB Concentration (µg/kg ww)				Lipid-normalized Total PCB concentration (mg/kg lipid)			
		Wild		Hatchery		Wild		Hatchery	
		result	Qual	result	Qual	result	Qual	result	Qual
Lower Waterway (LW [RM 0.3 to 0.9])	1	9.3	J	14	J	0.62	J	1.0	J
	2	21[a]		38		1.2		3.2	
	3	30	J	18	J	3.0	J	1.1	J
Mean ± SD		20 ± 10		23 ± 13		1.6 ± 1.2		1.8 ± 1.2	
Middle Waterway (MW [RM 2.7 to 2.9])	1	6.9	J	141	J	0.25	J	12	J
	2	10	J	36	J	0.71	J	2.6	J
	3	20	J	170	J	0.74	J	11	J
Mean ± SD		12 ± 6.8		120 ± 71		0.57±0.27		8.5 ± 5.2	

[a] Result represents the average of two laboratory duplicates

J – Estimated value

SD – standard deviation

2.3 Project/ Task Description and Schedule

This section provides the schedule and an overview of the sampling and analysis activities and to address the objectives outlined in Section 2.2. Detailed sampling designs are presented in Section 3.1.

2.3.1 Schedule

Sampling will be conducted in two separate events. The first event will occur in late April or early May to collect juvenile chum salmon during the peak of their outmigration. The second event will be conducted in June 2009 to collect juvenile Chinook salmon during the peak of their outmigration. Chum salmon collected in April 2009 will be archived until after the June sampling is complete and it is known that sufficient juvenile Chinook salmon have been retained.

Specific sampling dates for the second sampling event will be determined based on availability of all fish collection permits. If possible, sampling will take place the first or second week in June to maximize residence time of wild juvenile Chinook salmon in the EW during the period when there is a reasonable likelihood of collecting sufficient numbers of juvenile Chinook to meet sampling goals (See Section 2.2). While residence times are likely greater in August and September, insufficient numbers are likely to be present at that time to meet sampling goals. Chemical analysis of the samples described in Section 3.4 will be completed approximately 10 weeks after sample compositing and homogenization has been completed in the analytical laboratory. Data validation will be completed approximately 3 weeks after receipt of the chemistry data. A draft data report will be completed approximately 45 days following receipt of the validated data.

2.3.2 Sampling design overview

Although the targeted species of salmon for collection is juvenile Chinook salmon, the numbers of juvenile Chinook salmon in the EW can be limited (as described in Section 3). Therefore, juvenile chum salmon will also be sampled as a surrogate species. Both juvenile Chinook and chum salmon will be collected by beach seining from Slip 27 and near the mouth of Slip 36 (Map 2-1) during the two separate sampling events described in Section 2.3.1. The juvenile chum salmon will be analyzed if insufficient numbers of juvenile Chinook salmon are collected.

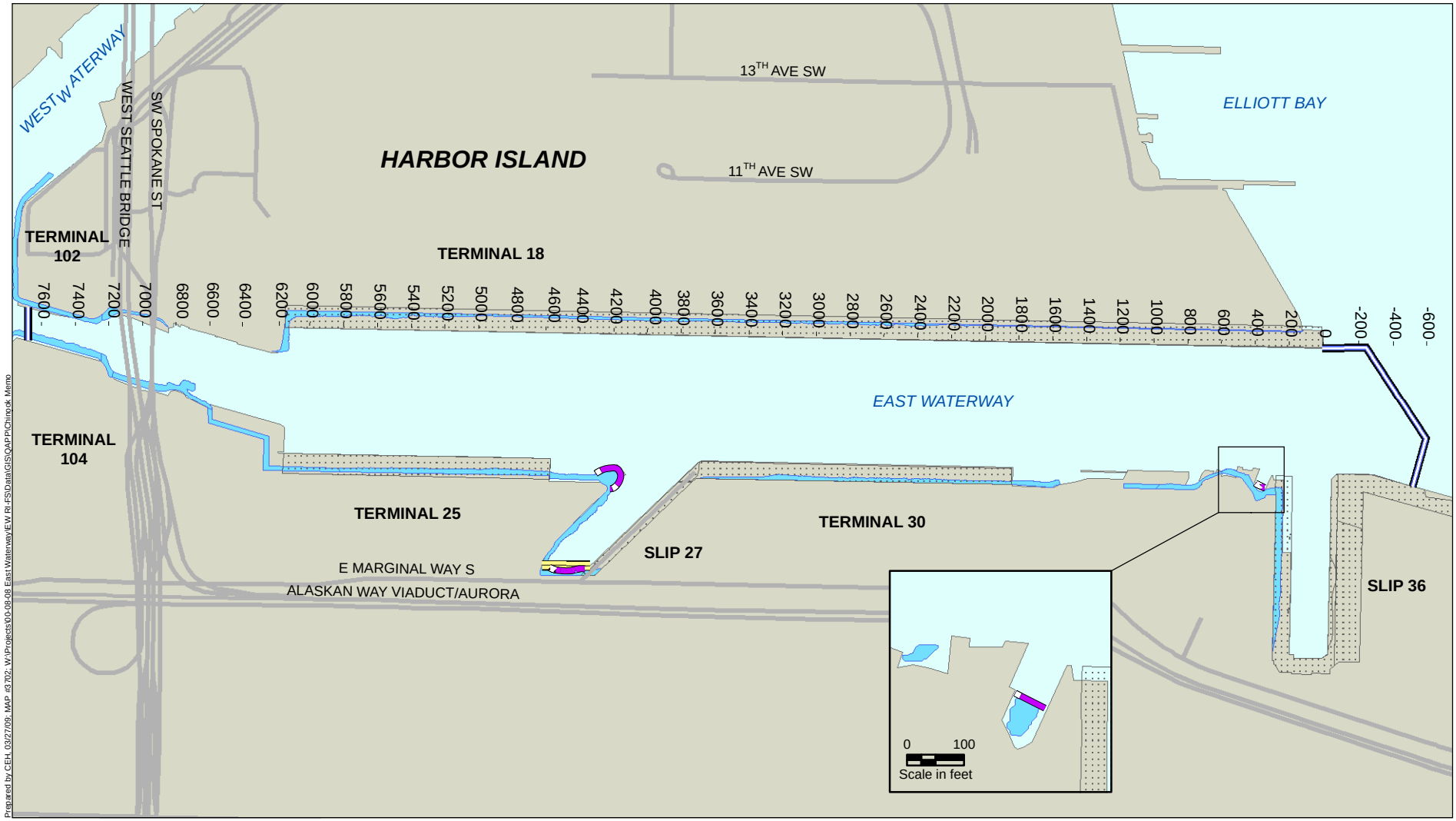
In order to maximize the amount of stomach contents available for analysis from the limited number of fish permitted for lethal take under the NMFS permit, fish stomach contents will be removed from all fish and composite samples of stomach contents analyzed for PAHs and metals. Whole body samples (with stomach contents removed) will be analyzed as composite samples for the full suite of COIs in the EW.

2.4 DATA QUALITY OBJECTIVES AND CRITERIA FOR CHEMICAL MEASUREMENTS

The overall data quality objective (DQO) for this project is to develop and implement procedures that will ensure the collection of representative data of known, acceptable, and defensible quality. Parameters used to assess data quality are precision, accuracy, representativeness, comparability, completeness, and sensitivity. These parameters are discussed, and specific data quality indicators (DQIs) for tissue laboratory analysis are presented in Section 3.5 and in the Fish and Shellfish Tissue Collection QAPP (Windward 2008).

2.5 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

The Superfund Amendments and Reauthorization Act of 1986 requires the Secretary of Labor to issue regulations through the Occupational Safety and Health Administration (OSHA) to provide health and safety standards and guidelines for workers engaged in hazardous waste operations. Federal regulation 29CFR1910.120 requires training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and 8-hour refresher courses, as necessary, to meet the OSHA regulations.



Prepared by CEH, 03/27/09. MAP #3702. W:\Projects\00-08-08 East Waterway\EW RI-FS\Data\GIS\QAPP\Chinook Memo

Map 2-1
Proposed Beach Seine Locations
Chinook QAPP
East Waterway Operable Unit

Other relevant regulations involve collection permits. Two sampling permit are needed for the sampling described in this QAPP addendum (Table 2-3). Permits are required by the Washington State Department of Fish and Wildlife (WDFW) for any scientific collection of organisms and a permit is required by the National Marine Fisheries Service (NMFS) for lethal and incidental catch of threatened fish species (i.e., steelhead salmon and Chinook salmon). A NMFS permit application was submitted on October 19, 2009. An application was submitted to WDFW on March 20, 2009. The FC will be in possession copies of the permits during field sampling, as required by the permit. Copies of the permits will be available upon request.

Table 2-3. Sampling permits required for EW juvenile Chinook salmon collection

PERMIT	PERMIT STATUS
NMFS Endangered Species Act Section 10(a)(1)(A) research permit for threatened and endangered species (i.e., Chinook salmon and steelhead salmon)	application submitted October 19, 2009 for addition of lethal take to Scientific Research Permit 1605
WDFW scientific collection permit	application submitted March 19, 2009

NMFS – National Marine Fisheries Service

WDFW – Washington State Department of Fish and Wildlife

2.6 DOCUMENTATION AND RECORDS

Documentation and records including field operations records, laboratory records, data reduction, and data report are as reported in the Fish and Shellfish Tissue Collection QAPP (Windward 2008).

3 Data Generation and Acquisition

This section describes the methods that will be used to collect, process, and analyze juvenile Chinook or chum salmon whole body tissue and stomach content samples collected from the EW. Elements include sampling design and methods; sample handling and custody requirements; analytical chemistry methods; QA/QC; instrument and equipment testing, inspection, and maintenance; instrument calibration; supply inspection and acceptance; non-direct measurements; and data management.

3.1 SAMPLING DESIGN

This section presents the sampling design including the compositing procedures, numbers of samples, the analyte list and associated methods, and the field sampling plan.

The goal of the sampling design is to characterize average concentrations of EW chemical of interest (COI) whole body tissue burdens and average stomach content tissue burdens of PAHs and metals of juvenile Chinook salmon collected in the EW. To this end, composite samples will be used in order to represent more individuals and thus a greater proportion of the population in samples. Compositing is also necessary to obtain sufficient tissue mass to analyze for the full suite of COIs. The stomach content samples will be composited as they are collected. The final compositing scheme for the whole body tissue samples will be determined in consultation between the EWG and EPA after completion of sample collection.

3.1.1 Analyte list, and mass requirements

COIs identified for the LDW are presented in Table 3-1. This list, with the addition of dioxins and furans will provide a basis for the analyte list for the EW because sufficient tissue data do not currently exist to provide a site-specific list.

Table 3-1. COIs from LDW RI/FS

METALS	SVOCs
Antimony	1,2-Dichlorobenzene
Arsenic	1,4-Dichlorobenzene
Cadmium	2-methylnaphthalene
Chromium	2-Methylphenol
Cobalt	Benzoic acid
Copper	Benzyl alcohol
Lead	Bis(2-ethylhexyl)phthalate
Mercury	Di-n-butyl phthalate
Molybdenum	Hexachlorobenzene
Nickel	Pentachlorophenol
Selenium	Phenol
Silver	**PAHs**
Thallium	1-methyl naphthalene
Vanadium	2-methyl naphthalene
Zinc	Acenaphthene
BUTYLTINS	Acenaphthylene
Dibutyltin as ion	Anthracene
Tributyltin as ion	Benzo(a)anthracene
ORGANOCHLORINE PESTICIDES	Benzo(a)pyrene
4,4'-DDD	Benzo(b)fluoranthene
4,4'-DDE	Benzo(g,h,i)perylene
4,4'-DDT	Benzo(k)fluoranthene
Aldrin	Chrysene
alpha-BHC	Dibenzofuran
gamma-BHC	Dibenzo(a,h)anthracene
Chlordane (alpha and gamma)	Fluoranthene
Dieldrin	Fluorene
Endrin	Indeno(1,2,3-cd)pyrene
Heptachlor	Naphthalene
Methoxychlor	Phenanthrene
PCBs	Pyrene
Total PCBs (Aroclors and congeners)	

The analytical tissue methods and mass requirements for the COIs are presented in Table 3-2. Additionally, a single homogenized aliquot of tissue mass may be used for more than one analysis (e.g., an extract may be split into two extract aliquots for PCB Aroclors and organochlorine pesticide analyses). If insufficient tissue mass is collected then, EWG will consult with EPA to identify the appropriate analytical strategy. There are two options for measuring PAHs in stomach contents. The priority PAHs may be measured by EPA 8270 at ARI or PAHs and alkylated homologs by EPA 8270SIM at

CAS. The alkylated homologs are not typically components of the mixtures used in toxicity studies that provide TRVs. However, they can be a substantial portion of the total PAH concentration in field-exposed organisms. The method for PAH analysis will be determined in conjunction with EPA once the sample mass is determined. Method modifications may include modified extraction techniques (e.g., adjusting the final extract volume), using a lower concentration for the lowest standard in the initial calibration, or adjusting the amount of extract injected into the instrument.

Table 3-2. Tissue mass (wet weight) required per sample

Analyte	Method	Tissue Mass (g)	
		Whole Body	Stomach Contents
PCB congeners and dioxins and furans	EPA 1668	25	na
PCB Aroclors	EPA 8082	25	na
Organochlorine pesticides	EPA 8081		
SVOCs (including PAHs, and phthalates)	EPA 8270D	20	10
PAHs (including alkylated homologs)	EPA 8270SIM		10[a]
Mercury	EPA 7471A	2	na
Metals[b]	EPA 6010B or EPA 6020	3	3
Tributyltin	Krone et al. 1989	10	na
Lipids		5	na
Total solids	PSEP or EPA 160.2	5	5
Total Mass		**90**	**18**

[a] The stomach contents can be analyzed for priority PAH by EPA 8270D or PAH and alkylated homologs by EPA 8270SIM. The analytical method will be identified following collection once the final mass is known.

[b] Antimony, arsenic, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc.

EPA – US Environmental Protection Agency

na not applicable

NOAA – National Oceanic and Atmospheric Administration

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

PSEP – Puget Sound Estuary Program

SVOC – semivolatile organic compound

3.1.2 Conceptual sampling design

To meet the study objectives as presented in Section 2.2, juvenile Chinook will be sampled from the EW to estimate their chemical exposure during outmigration through the EW. Sampling for juvenile chum salmon will occur in April 2009 and sampling for juvenile Chinook salmon will be conducted in June 2009 to coincide with peak

outmigration of each species. Juvenile chum salmon collected in April will be used as a surrogate for whole body and/or dietary analyses if insufficient numbers of juvenile Chinook salmon or mass of stomach contents tissue are collected for analysis during the June sampling event. Chum salmon specimens (and stomach contents) will be archived until after Chinook sampling is complete and it is known whether sufficient juvenile Chinook salmon have been retained. If sufficient Chinook are collected, the chum will be disposed of.

Both sampling events (April and June) will take place using a beach seine from Slip 27 and near the mouth of Slip 36 (Map 2-1). These two locations are the most appropriate places to beach seine in EW. An alternate location at the southern end of EW around the Spokane Street Bridge complex is not appropriate because outmigrating juvenile salmon will not have been in EW for sufficient time for exposure within the EW.

During the April 2009 sampling event, only chum salmon will be collected. Fishing will begin at Slip 27 and will continue until 200 chum salmon are collected. The Slip 36 location will be sampled at the discretion of the FC if he judges that sampling from that location may yield better results. In order to ensure that sufficient incidental take is allowed under the NMFS permit to conduct the June sampling event, the April sampling event will cease if 50 wild juvenile Chinook salmon or 100 hatchery juvenile Chinook salmon are incidentally captured (½ the allowed incidental take). The maximum effort for the April event is two 8-hour field days.

During the June 2009 sampling event only juvenile Chinook salmon will be collected. Fishing will begin at Slip 27 and will continue until the maximum number of Chinook permitted for lethal take (100 hatchery juvenile Chinook salmon and 60 wild juvenile Chinook salmon; Table 3-3) are collected. Sampling locations will be sampled at the discretion of the FC to the extent that he judges that sampling from a given location will yield optimal results. The maximum effort for the June event is three field days. Sampling will stop on each day after 8-hours, when three or fewer target juvenile Chinook salmon are captured in three consecutive attempts, or the numbers of salmon captured approach those allowed on the NMFS permit application (Table 3-3). [5] Species and origin (hatchery vs. wild) will be verified for juvenile Chinook samples by the Taylor Associates FC. Wild fish will be distinguished from hatchery fish by the presence of an intact adipose fin, although it is acknowledged that a small percentage of the hatchery fish may not be fin-clipped due to inefficiencies of the machines.

[5] Other closely related fish that may be present at this time include juvenile chum salmon, juvenile coho salmon, yearling hatchery Chinook salmon, juvenile steelhead, and juvenile cutthroat trout.[6] If lower tissue masses are obtained, EWG will consult with EPA on alternate MDLs once the samples are collected.

Table 3-3. Take requested in NMFS Scientific Research Permit application

ESU	Life stage	Origin	Take Activity	Number of Fish Requested	Requested Unintentional Mortality
PS Chinook salmon	juvenile	hatchery	Intentional mortality	100	na
PS Chinook salmon	juvenile	wild	Intentional mortality	60	na
PS Chinook salmon	Juvenile	hatchery	capture, handle, release	200	0/200
PS Chinook salmon	Juvenile	wild	capture, handle, release	100	0/100
PS Chinook salmon	adult	hatchery	capture, handle, release	2	0/2
PS Chinook salmon	adult	wild	capture, handle, release	2	0/2
PS Steelhead	juvenile	hatchery	capture, handle, release	50	2/50
PS Steelhead	juvenile	wild	capture, handle, release	50	2/50
PS Steelhead	adult	hatchery	capture, handle, release	2	0/2
PS Steelhead	adult	wild	capture, handle, release	2	0/2

Note: The number of juvenile Chinook salmon requested for intentional mortality is based on 2003 sampling of both wild and hatchery juvenile Chinook salmon from nearby in the LDW

na not applicable

Eight whole body samples and two stomach content samples will be created if fish and stomach content of sufficient mass are collected (Table 3-4). The number of stomach contents samples will be based on the amount of available tissue mass, whereas, the number of whole body samples is to provide a sufficient number of samples to calculate a robust 95% upper confidence limit on the mean (95% UCL). The minimum sample mass required for the stomach contents analytes is approximately 18 g (Table 3-2).[6] Chemical concentrations in whole body tissue will be analyzed in the fish killed for stomach content analysis. During the 2003 LDW sampling, 75 Chinook were needed to create a single stomach content composite sample. It is estimated that with 160 juvenile Chinook, it may be possible to create two or more composite samples of stomach contents thus providing a minimal estimate of variability in chemical concentrations. If possible, hatchery and wild fish will not be composited together for creation of whole body samples. Furthermore, if there are not sufficient juvenile Chinook salmon collected to create the whole-body or stomach-contents samples and there are sufficient chum salmon collected, then chum salmon may be used as a surrogate for the creation of some or all samples. The decision to use chum salmon as a surrogate for the juvenile Chinook will be made following consultation with EPA and stakeholders and approval by EPA.

Juvenile Chinook salmon and juvenile chum salmon tissue or stomach contents will not be combined in any samples.

[6] If lower tissue masses are obtained, EWG will consult with EPA on alternate MDLs once the samples are collected.

Table 3-4. Target number of composite whole body and stomach contents samples

Sample type	Number of Samples	Number of Fish per Sample	Total Number of Fish	Permitted Lethal Take of Unclipped Fish	Permitted Lethal Take of Clipped Fish
Whole body	8	6-20[a]	48-160[a]	100	60
Stomach contents	≥2[b]	≥20[b]	40-160[b]		

[a] Each composite will consists of at least 6 individual whole-body fish, all fish caught up to the 160 requested in the NMFS permit will be assigned to composites resulting in a maximum of 20 fish per composite; composites will be comprised of a sufficient number of individual whole body fish to make a composite sample weighing at least 90 g. The final compositing scheme will be determined in consultation between EWG and EPA based on the catch results.

b. The number of stomach content samples created will be determined based on the total mass of stomach contents collected. Stomach contents from all fish captured will be divided to create composites that include the stomachs from at least 20 fish. If sufficient tissue mass is collected to create more composites, then more than two composites will be analyzed.

The April sampling event will take place the last week in April or the soonest possible time afterward when the WDFW permit is awarded. If possible, this event will be coordinated with release of hatchery chum salmon from the Muckleshoot Indian Tribal hatchery.

3.2 Sample Collection Methods

The targeted fish will be collected using a standard beach seine. The beach seine measures 37 m long and 3 m deep, with 6-mm mesh in the wings and 5-mm mesh in the center bag. The seine is equipped with floats to minimize snagging of the lead line on submerged pilings, riprap, and other debris, and 30-m ropes to haul the net to shore. The net will be deployed at low tide, as close to slack water as possible. Prior to each deployment, the area, time of day, and weather conditions will be recorded. To avoid contamination, the beach seine will be cleaned of all debris before being deployed. The net will be deployed 30 m from shore and parallel to the beach using an outboard-powered boat and three or four workers. If deployment 30 m from shore is not possible, the field crew will adapt as necessary in the field. One or two workers will stand on shore holding the 30-m rope attached to one end of the net until the reversing boat pulls the rope taut. Once the rope is taut, another worker will feed the net from the bow of the boat into the water as the skipper slowly motors in reverse to lay out all the net parallel to shore. The rope on the opposite end of the net will then be motored to shore, and the person who had been in the bow of the boat deploying the net will jump ashore with the rope end to assist with retrieving the net. Teams of one or two workers will then stand at each end of the net, approximately 40 m apart, to pull the net toward shore at a steady rate. When the net is approximately 10 m from shore, the two teams will move together until they are about 10 m apart for the final hauling of the net up onto the shore.

Fish will be processed using a live sampling technique to minimize the number of non-target species mortalities through species sorting and processing prioritization. Upon

completion of an individual effort, the catch will be immediately emptied into a large plastic tub or directly returned to the water, whichever is judged to be less stressful to the fish. If necessary, tubs will be filled with static water during seining. Field technicians will sort the catch by species and size into numerous smaller tubs. Target species will be separated from non-target species and processed. Non-target species will be identified to the lowest practical taxon, their numbers estimated and returned immediately to the location of capture. Salmon and other sensitive species will be processed prior to heartier species. Fish unconscious or upside down will be held in gently running water until activity becomes normal prior to release.

The targeted number of individual juvenile Chinook salmon captured in the beach seine will be checked for a clipped adipose fin or presence of a coded wire tag to determine whether the fish is wild[7] or hatchery-raised. Fish will then be sorted and placed in a 5-gal bucket filled with ice. All fish will be carefully inspected to ensure that the sampling equipment did not damage their skin or fins. All individual specimens from each beach seine set will be placed in one large Ziploc® bag, with the date, sampling location, and set number recorded on the outside of the bag with indelible ink, and then placed in a cooler with ice. The iced fish will be transported in coolers to ARI for further processing of tissue samples and stomach content analysis.

3.2.1 Location positioning

A handheld global positioning system receiver unit will be used to obtain coordinates in the sampling areas. Coordinates will be taken at the starting location of each beach seine deployment. The GPS unit will receive radio broadcasts of GPS signals from satellites to produce positioning accuracy to within 1-2 m. Washington State Plane coordinates North (NAD 83) will be used for the horizontal datum.

3.2.2 Identification scheme

Unique alphanumeric sample numbers will be assigned to each individual and each composite sample. The first four characters are "EW09" to identify the East Waterway project area and that the sample was collected in 2009. The next characters will identify the location: either S36 for Slip 36 or S27 for Slip 27. The next three characters will identify the effort number, by a three-digit number, numbered sequentially (e.g., the 2nd beach seine effort after the start of sampling would be 002). The next three characters will identify the individual species type, Chinook salmon (CHN) or chum salmon (CHU). Following these identifiers, "H" or "W" designates hatchery or wild fish. The final identifier is a sample number. For example, the sample identifier EW09-S27-003-CHN-W- 01 would represent an individual wild fish collected from Slip 27 during the third sampling effort. All relevant information for each individually

[7] A small percentage of hatchery fish are not clipped or tagged before release. (Non-marked fish will be considered wild.).

wrapped and labeled target specimen, including specimen ID, length, weight, external abnormalities, sample date, time, and location number will be recorded on the Target Species Tally Form and included as an appendix to the data report. All pertinent data associated with each individual fish specimen will be traceable.

Once samples are composited in the lab, a unique sample number will be assigned to the composite. The compositing scheme will be determined in consultation with EPA and will specify which individual fish to include in each composite (see Section 3.4) and the resulting composite identifier. Tissue type will be indicated as whole body (WB) or stomach content (SC); each sample will be numbered sequentially following the letters "comp." For example, the first Chinook salmon whole body composite sample would be identified as EW09-CHN-WB-comp-01.

3.2.3 Field equipment

The items needed in the field for sampling are identified in Table 3-5. The FC will check that all equipment is available and in working order each day before sampling personnel go into the field.

Table 3-5. Field equipment for fish collection

Field Equipment	Fish Collection
QAPP	X
Health and safety plan	X
Key personnel contact information list	X
Field collection forms	X
Field notebooks (Rite in the Rain®)	X
Chain-of-custody forms	X
Pens, pencils, Sharpies®	X
Tide tables	X
Study area maps	X
Fish identification guides	X
GPS (with extra batteries)	X
Digital camera	X
Cellular phone	X
Marine radio	X
Alconox® detergent	X
Scrub brushes	X
Paper towels	X
Garbage bags	X
Buckets (5 and 2 gallon)	X
Coolers	X
Ice (wet)	X
Heavy-duty aluminum foil	X

Field Equipment	Fish Collection
Zip-lock freezer bags (assorted sizes)	X
Plastic bins for specimen sorting	X
Dip nets	X
Calipers	X
Measuring boards	X
Scales	X
Beach seine net	X
Powder-free nitrile exam gloves	X
Rubber work gloves	X
Rain gear	X
Waders	X
Personal flotation devices	X
First aid kit	X
Duct tape	X

GPS – global positioning system

QAPP – quality assurance project plan

3.3 Sample Handling and Custody Requirements

This section describes how individual samples will be processed. Sample tracking and custody procedures, and shipping requirements are described in the Fish and Shellfish Tissue Collection QAPP (Windward 2008).

Prior to freezing the fish and stomach contents for storage, stomachs will be surgically removed at ARI by Windward staff. During the processing, hatchery and wild specimens from each beach seine set will be kept separate from one another and processed one at a time to ensure that individual specimens are tracked properly. Each individual of the target species will be weighed using an analytical scale accurate to 0.5 g wet weight. Fish will be cut from the anal vent to the head and the entire GI tract removed. Fish will be checked for the presence of a coded wire tag. If a tag is detected it will be excised for later determination of the origin of the fish. Gut contents will be squeezed out of the stomachs by hand or if this is infeasible, the gut will be cut open with scissors and gut contents scraped out. Fullness of the gut and distinguishable prey contents will be noted. Gut contents will be weighed to the nearest 0.01 g and composited together with sufficient numbers of randomly selected fish to generate a suitable composite sample. A composite will be complete when the accumulated gut contents weigh at least 18 g and includes the gut contents from at least 20 fish. Composite samples will be collected in pre-cleaned tared 4 oz jars, with an identification label attached indicating the sample number and date sampled. After removal of gut contents, the GI tract will be returned to the fish and the fish re-weighed. The fish will be individually placed in a pre-cleaned glass jar with all liquid from the

fish and labeled with the label taped to the outside of the jar. Samples will be stored frozen at the laboratory.

The final homogenization and compositing scheme will be determined in consultation between the EWG and EPA. After the final compositing scheme is determined, all specimens will be thawed and homogenized using a blender, chopper, and/or meat grinder. Tissue dissection and homogenization will be performed by qualified laboratory technicians following ARI's standard operating procedures (SOPs) under Windward's oversight. All equipment used for fish processing will be completely disassembled and cleaned prior to initial use and after each composite sample to ensure that no cross-contamination occurs, in accordance with the laboratory's SOP. The tissue may be cut with solvent-rinsed knives or razor blades into smaller pieces (i.e., 3-in. slices) prior to chopping or blending to ensure that the tissue is homogenized into a creamy paste with no discernable bits remaining (e.g., no large pieces of bones or fins). The composited, homogenized tissue sub-sample selected for extraction or analysis must be representative of the entire whole body or stomach contents composite sample.

3.4 ANALYTICAL METHODS

This section provides a brief summary of the analytical methods. Data quality indicators (DQIs), quality assurance/quality control, instrument/equipment testing, instrument inspection and maintenance, instrument calibration, and inspection/acceptance of supplies and consumables, and data management are discussed in the Fish and Shellfish Tissue Collection QAPP (Windward 2008)

Tissue homogenization of the composite samples will be done at ARI. Individual whole body fish will be homogenized together to form a composite sample according to the compositing plan described in Section 3.2. Individual stomach contents will be homogenized together to according to the compositing plan described in Section 3.2. The tissue sample homogenate from a subset of composite whole body samples analyzed for dioxin/furans and PCB congeners will be shipped from ARI to Analytical Perspectives.

All composite whole body tissue samples will be analyzed for PCBs as Aroclors, semivolatile organic compounds (SVOCs), metals, tributyltin, pesticides, lipids, and total solids (Table 3-6). A subset of samples will be analyzed for PCB congeners and dioxins/furans. The specific samples selected for PCB congener and dioxin/furan analysis will be determined based on the PCB Aroclor data in consultation with EPA.

Table 3-6. Numbers of composite tissue samples to be analyzed for each analyte group

Analyte	Number of Composite Tissue Samples by Type	
	Chinook Salmon	
	WB	Stomach Content
PCB congeners	TBD	0
Dioxins/furans	TBD	0
PCB Aroclors and organochlorine pesticides	8	0
SVOCs (including PAHs)	8	2 [b]
Mercury	8	0
Metals[a]	8	2
Tributyltin	8	0
Lipids	8	na
Total solids	8	2

[a] Antimony, arsenic, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, zinc.

[b] Stomach contents will only be analyzed for the PAHs

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

SVOC – semivolatile organic compound

TBD – to be determined in consultation with EPA

WB – whole body

The laboratories will store the tissue homogenate samples frozen. Analytical methods and laboratory sample handling requirements are presented in Table 3-7.

Table 3-7. Analytical methods and sample handling requirements for composite tissue samples

Parameter	Method	Reference	Laboratory	Maximum Sample Holding Time	Container	Method of Preservation
PCBs as Aroclors	GC/ECD	EPA 8082A	ARI	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
PCB congeners	HRGC/HRMS	EPA 1668	Analytical Perspectives	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
Organochlorine pesticides[a]	GC/ECD	EPA 8081A	ARI	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
Organochlorine pesticides[a]	GC/MS/MS	EPA 1699 (modified)	CAS	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
SVOCs including PAHs[b]	GC/MS	EPA 8270D	ARI	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
PAHs and alkylated homologes	GC/MS	EPA 8270SIM	CAS	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
Mercury	CVAA	EPA 7471	ARI	60 days	glass jar (homogenate)	freeze/-20 °C
Total metals[c]	ICP/MS, ICP/AES, or GFAAS	EPA 6020, 6010B, or 7000	ARI	6 months	glass jar (homogenate)	freeze/-20 °C
Tributyltin, dibutyltin, monobutyltin (as ions)	GC/FPD	Stallard et al. (1988)	ARI	1 year to extract, 40 days to analyze	glass jar (homogenate)	freeze/-20 °C
Lipids	DCM: acetone extraction gravimetric	NOAA (1993)	ARI	1 year	glass jar (homogenate)	freeze/-20 °C
Total solids	freeze-dried	PSEP (1997)	ARI	6 months	glass jar (homogenate)	freeze/-20 °C

[a] Target pesticides include: 4,4′-DDT, 4,4′-DDE, 4,4′-DDD, 2,4′-DDT, 2,4′-DDE, 2,4′-DDD, aldrin, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC, oxychlordane, alpha- and gamma-chlordane, cis- and trans-nonachlor, dieldrin, endosulfan, endosulfan sulfate, endrin, heptachlor, heptachlor epoxide, hexachlorobenzene, methoxychlor, mirex, and toxaphene. (

[b] Target PAHs include: anthracene, pyrene, dibenzofuran, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene, fluoranthene, benzo(k)fluoranthene, acenaphthylene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benzo(a)anthracene, acenaphthene, phenanthrene, fluorene, 1-methylnaphthalene, naphthalene, 2-methylnaphthalene.

[c] Arsenic, antimony, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.

ARI – Analytical Resources, Inc.

BHRAA –borohydride reduction atomic absorption

CAS – Columbia Analytical Services

CVAA – cold vapor atomic absorption

DCM – dichloromethane

GC/ECD – gas chromatography/electron capture detector

GC/FPD – gas chromatography/flame photometric detection

GC/MS – gas chromatography/mass spectrometry

GC/MS/MS – gas chromatography/mass spectrometry/mass spectrometry

GFAAS – graphite furnace atomic absorption spectrophotometry

HRGC/HRMS – high resolution gas chromatography/high resolution mass spectrometry

HG/AFS – hydride generation/atomic fluorescence spectrometry

ICP/AES – inductively couple/plasma atomic emission spectrometry

ICP/MS – inductively coupled/plasma mass spectrometry

PAH – polycyclic aromatic hydrocarbon

PSEP – Puget Sound Estuary Program

SIM – select ion monitoring

SVOC – semivolatile organic carbon

4 Assessment/Oversight

4.1 Compliance Assessments and Response Actions

EPA or other management agencies may observe field activities during each sampling event, as needed. If situations arise where there is an inability to follow QAPP methods precisely, the Windward PM will determine the appropriate actions or consult EPA if the issue is significant. Procedures for compliance assessments, response for field sampling, corrective action for laboratory analysis, and reports to management are presented in the Fish and Shellfish Tissue Collection QAPP (Windward 2008)

5 Data Validation and Usability

5.1 Data Validation

The laboratory analyst is responsible for ensuring that the analytical data are correct and complete, that appropriate procedures have been followed, and that QC results are within the acceptable limits. The data validation process begins within the laboratory with the review and evaluation of data by supervisory personnel or QA specialists. The project QA/QC coordinator is responsible for ensuring that all analyses performed by the laboratories are correct, properly documented, and complete, and that they satisfy the project data quality objectives (DQOs) specified in this QAPP.

Data are not considered final until validated. Data validation will be conducted following EPA guidance (EPA 1995, 1996, 1999, 2004, 2005). Independent third-party data review and summary validation of the analytical chemistry data will be conducted by EcoChem. A minimum of 20% of sample results or a single SDG will undergo full data validation. Full data validation parameters include:

- Quality control analysis frequencies
- Analysis holding times
- Laboratory blank contamination
- Instrument calibration
- Surrogate recoveries
- LCS recoveries
- MS recoveries

- MS/MSD RPDs
- Compound identifications
- Compound quantitations
- Instrument performance check (i.e., tune ion abundances)
- Internal standard areas and retention time shifts

If no discrepancies are found between reported results and raw data in the set that undergoes full data validation, then validation can proceed as a summary-level data validation on the rest of the data using all the QC forms submitted in the laboratory data package. QA review of the sediment and tissue chemistry data will be performed in accordance with the QA requirements of the project, the technical specifications of the analytical methods indicated in Tables 3-9, 3-10, and 3-11 in the Fish and Shellfish tissue collection QAPP (Windward 2008) and EPA guidance for organic and inorganic data review (EPA 1995, 1996, 1999, 2004, 2005). The EPA PM may have EPA peer review the third-party validation or perform data assessment/validation on a percentage of the data.

All discrepancies and requests for additional, corrected data will be discussed with the laboratories prior to issuing the formal data validation report. The project QA/QC coordinator should be informed of all contacts with the laboratories during data validation. The review procedures used and findings made during data validation will be documented on worksheets. The data validator will prepare a data validation report that will summarize QC results, qualifiers, and possible data limitations. Only validated data with appropriate qualifiers will be released for use in the EW supplemental remedial investigation/feasibility study. Rejected data will not be used for any purpose.

5.2 RECONCILIATION WITH DATA QUALITY OBJECTIVES

Data quality assessment will be conducted by the project QA/QC coordinator in consultation with EPA guidelines. The results of the third-party independent review and validation will be reviewed, and cases where the projects DQOs were not met will be identified. The usability of the data will be determined in terms of the magnitude of the DQO exceedance.

6 References

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Appendix A Field Collection Forms

This appendix contains the following forms that will be used, as necessary, during this study:

- Protocol Modification Form
- Target Species Tally Form
- Non-Target Species Tally Form
- Mussel and Shrimp Collection Form
- Specimen Label
- Composite Sample Form

PROTOCOL MODIFICATION FORM

Project Name and Number: **EW RI/FS – Fish and crab sampling (08-08-09-41)**

Material to be Sampled:

Measurement Parameter:

Standard Procedure for Field Collection & Laboratory Analysis (cite reference):

Reason for Change in Field Procedure or Analysis Variation:

Variation from Field or Analytical Procedure:

Special Equipment, Materials or Personnel Required:

Initiator's Name: Date:

Project Manager: Date:

QA Manager: Date:

Wind Ward environmental LLC

TARGET SPECIES TALLY FORM

Project Name: EW RI/FS – Fish and crab sampling **Project #: 08-08-09-41**

Species sampled: **Field crew initials:**

Comments:

COLLECTION DATE	COLLECTION TIME	LOCATION ID	COLLECTION METHOD	SPECIMEN ID #	LENGTH (mm)	WEIGHT (g)	GENDER	COMMENTS

NON-TARGET SPECIES TALLY FORM

Project Name: EW RI/FS – Fish and crab sampling **Project #: 08-08-09-41**

Field crew initials:

Comments:

COLLECTION DATE	COLLECTION TIME	LOCATION ID	COLLECTION METHOD	SPECIES	LENGTH RANGE (mm)	TOTAL WEIGHT (g ww)	COUNT	COMMENTS

STOMACH CONTENTS TALLY FORM

Project Name: EW RI/FS – Fish and crab sampling **Project #: 08-08-09-41**

Field crew initials:

Comments:

COLLECTION DATE	COLLECTION TIME	LOCATION ID	SPECIMEN ID	INITIAL FISH WEIGHT (g ww)	STOMACH CONTENT WEIGHT (g ww)	FISH WEIGHT W/O STOMACH CONTENTS (g ww)	RUNNING TOTAL STOMACH CONTENTS WEIGHT (g ww)

SPECIMEN LABEL

WINDWARD ENVIRONMENTAL LLC 200 WEST MERCER STREET, SUITE 401, SEATTLE, WA 98119 TEL: (206) 378-1364 FAX: (206) 217-0089	
Project #: **08-08-09-41**	Sampler:
Sampling date:	Retrieval time:
Location:	
Sample ID #:	
Comments:	

COMPOSITE SAMPLE FORM

Project Name: EW RI/FW – Fish and crab sampling **Project #: 08-08-09-41**

Date Composited: **Composited By:**

COMPOSITE SAMPLE ID #	SPECIMEN ID #	COLLECTION DATE	COLLECTION TIME	WEIGHT (g ww)

Comments: